

I/WE CLAIM:

1. Apparatus comprising:

a sterilization tunnel for surrounding a plurality of

containers with pressurized gas; and

a plurality of zones within a sterilization tunnel

having different sterilant concentration levels.

2. The apparatus of claim 1, wherein said plurality of zones have different gas flow rates.

1 3. Apparatus comprising:

2 a sterilization tunnel for surrounding a plurality
3 of containers with pressurized gas;

4 a sterilant supply source to supply sterilant into
5 the sterilization tunnel;

6 a plurality of sterilant concentration zones
7 within the sterilization tunnel;

8 at least one gas supply source to supply the
9 pressurized gas into the sterilization tunnel; and

10 at least one gas exit to allow the pressurized gas
11 to escape the sterilization tunnel.

1 4. The apparatus of claim 3, further including at least
2 one partition forming sterilant concentration zones.

1 5. The apparatus of claim 4, wherein each partition
2 comprises at least one opening for allowing objects to pass
3 through each partition.

1 6. The apparatus of claim 3, wherein the gas is sterile
2 air.

1 7. The apparatus of claim 3, wherein the sterilant is
2 hydrogen peroxide.

1 8. The apparatus of claim 3, further including a product
2 filler and a lidding apparatus opening into a sterile zone
3 of the sterilization tunnel.

1 9. The apparatus of claim 8, wherein the concentration of
2 the sterilant hydrogen peroxide is less than .5 ppm in the
3 sterile zone.

1 10. The apparatus of claim 3, further including an interior
2 bottle sterilization apparatus opening into a sterile zone
3 of the sterilization tunnel.

1 11. The apparatus of claim 10, wherein the concentration of
2 the sterilant hydrogen peroxide is about 1000 ppm in the
3 sterile zone.

1 12. The apparatus of claim 3, further including an
2 activation and drying apparatus opening into the
3 sterilization tunnel.

1 13. The apparatus of claim 12, wherein the concentration of
2 the sterilant hydrogen peroxide is about 3 ppm.

1 14. The apparatus of claim 3, further including a bottle
2 discharge apparatus opening into the sterilization tunnel.

1 15. The apparatus of claim 14, wherein the concentration of
2 the sterilant hydrogen peroxide is about .1 ppm.

3 16. The apparatus of claim 3, wherein the containers are
4 bottles.

1 17. Apparatus comprising:

2 a sterilization tunnel for surrounding a plurality
3 of containers with pressurized gas;

4 a sterilant supply source to supply sterilant into
5 the sterilization tunnel;

6 a plurality of zones having varying gas flow
7 within the sterilization tunnel;

8 at least one gas supply source to supply the
9 pressurized gas into the sterilization tunnel; and

10 at least one gas exit to allow the pressurized gas
11 to escape the sterilization tunnel.

1 18. The apparatus of claim 17, further including at least
2 one partition forming gas flow zones.

1 19. The apparatus of claim 18, wherein each partition
2 comprises openings for allowing objects to pass through each
3 partition.

1 20. The apparatus of claim 17, wherein the pressurized gas
2 is sterile air.

1 21. The apparatus of claim 17, wherein the sterilant is
2 hydrogen peroxide.

3 22. The apparatus of claim 17, further including an
4 activation and drying apparatus opening into a first of said
5 gas flow zones.

1 23. The apparatus of claim 22, wherein sterile air enters
2 the first gas flow zone at a rate of about 2400 cfm.

1 24. The apparatus of claim 23, wherein sterile air exits
2 the first gas flow zone at a rate of about 1500 cfm.

1 25. The apparatus of claim 17, further including a product
2 filler and a lidding apparatus opening into a second of said
3 gas flow zones of the sterilization apparatus.

1 26. The apparatus of claim 25, wherein sterile air enters
2 the second gas flow zone at a rate of about 1000 cfm.

1 27. The apparatus of claim 17, further including a bottle
2 discharge apparatus opening into a third of said gas flow

3 zones of the sterilization tunnel.

1 28. The apparatus of claim 27, wherein sterile air exits
2 the third gas flow zone at a rate of about 100 cfm.

1 29. The apparatus of claim 17, further including a bottle
2 infeed and sterilization apparatus with an opening into a
3 fourth gas flow zone of the sterilization tunnel.

1 30. The apparatus of claim 29, wherein sterile air enters
2 the infeed and sterilization apparatus at a rate of about
3 1800 cfm.

1 31. The apparatus of claim 29, wherein sterile air from the
2 infeed and sterilization apparatus together with the fourth
3 gas flow zone exits the infeed and sterilization apparatus
4 at a rate of about 3600 cfm.

1 32. The apparatus of claim 17, wherein the containers are
2 bottles.

1 33. A method comprising:

2 providing a sterilization tunnel for surrounding a
3 plurality of containers with pressurized gas;

4 introducing sterilant from a sterilant supply
5 source into the sterilization tunnel;

6 providing a plurality of sterilant concentration
7 zones within the sterilization tunnel;

8 introducing pressurized gas from at least one gas
9 supply source into the sterilization tunnel; and

10 allowing the pressurized gas to escape the
11 sterilization tunnel.

1 34. The method of claim 33, wherein the step of providing a
2 plurality of sterilant concentration zones further includes
3 the step of providing at least one partition for forming
4 said sterilant concentration zones.

1 35. The method of claim 34, further comprising allowing
2 objects to pass through each partition.

1 35 36. The method of claim 33, wherein the step of introducing
2 gas further comprises introducing sterile air.

1 36/37. The method of claim 33, wherein the sterilant is
2 hydrogen peroxide.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

1 38. Apparatus comprising:

2 means for providing a plurality of containers in a
3 sterilization tunnel;

4 means for providing a plurality of sterilant
5 concentration zones within the sterilization tunnel; and

6 means for providing a plurality of gas flow rates
7 within the sterilization tunnel.